Tool for Applying Torque to Fastening Elements

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Abstract

A succession of hexagonal elements 1b are connected by intervening breaking portions 1a (being formed for instance by spaced circumferential grooves around a hexagonal rod) and a lever 2 is engageable with the successive elements 1b. For tightening a fastening element 3 having a hexagonal socket in its head, the end most element 1b is inserted into the socket, and the lever is engaged with and used to turn the next adjacent element 1b. The breaking portion 1a between these two elements is destroyed when a predetermined torque is reached. Instead of being of rod, the elements 1b may be tubular to fit onto units or bolt heads.

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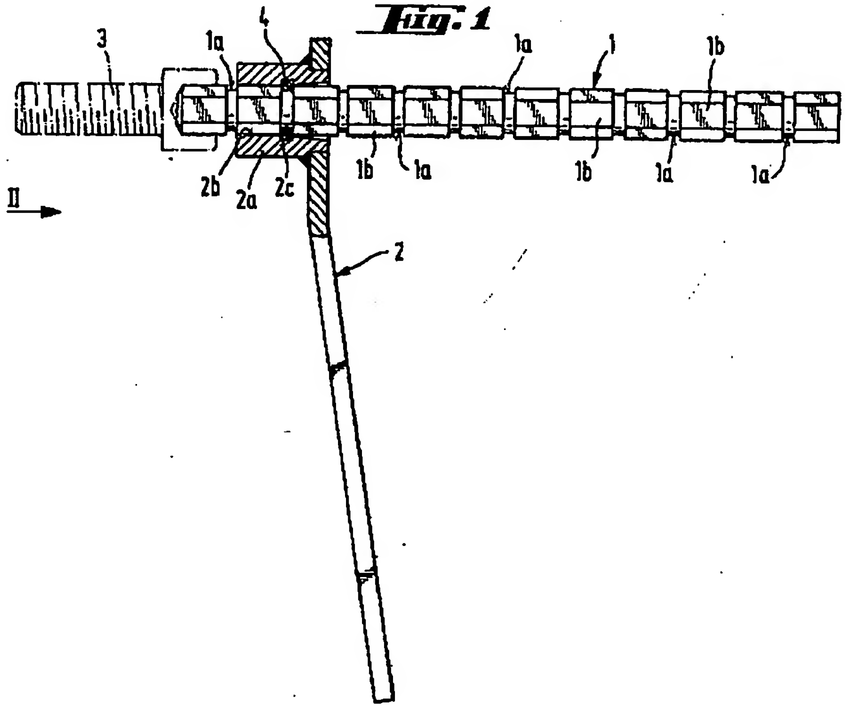
(54) Tool for Applying Torque to Fastening Elements

(57) A succession of hexagonal elements 1*b* are connected by intervening breaking portions 1*a* (being formed for instance by spaced circumferential grooves around a hexagonal rod) and a lever 2 is engageable with the successive elements 1*b*. For tightening a fastening element 3 having a hexagonal socket in its head, the end most element 1*b* is inserted into the socket, and the lever is engaged with and used to turn the next adjacent element 1*b*. The breaking portion 1*a* between these two elements is destroyed when a predetermined torque is reached. Instead of being of rod, the elements 1*b* may be tubular to fit onto units or bolt heads.

Fig. 1



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SPECIFICATION

Tool for Applying Torque to Fastening Elements

This invention relates to a tool for applying a torque to fastening elements such as screws, bolts, and nuts, comprising an entrainment part having entrainment surfaces for transmitting torque to a fastening element, and a lever arm for applying the torque.

Screw connections and expansible dowels very often have to be tightened with a predetermined torque, so that they can fulfil predetermined practical requirements. Expensive and sensitive special tools have hitherto been necessary to apply a specific torque. More especially in rough building-site operation such tools are not always sufficiently checked and cared for, so that the effectively-applied torque very often does not correspond with the theoretically-necessary torque. This is particularly dangerous when the effectively-applied torque is less than that which is theoretically necessary, since in this event a degree of safety is thought to have been achieved but is not effectively present.

In addition to adjustable tools, it is also known to provide means on the fastening element for limiting the tightening moment. However, these lead to the fastening elements being made considerably more expensive, which also has to be paid for even in the cases when, from the use point of view, limitation of tightening is not necessary, but for reasons of simplification only one kind of fastening element is held in stock.

Means provided in the fastening element for limiting the torque, after tightening, very often result in the presence on the element of dangerous broken edges and generally also have a disadvantageous effect so far as protection against corrosion is concerned.

Thus, the problem underlying the invention is to provide a simple and safe tool for applying a limited torque to fastening elements, such as screws, dowels, nuts or the like.

In accordance with the invention, this is achieved in that the entrainment part has regions which are arranged one after the other in succession and which are connected together by predetermined breaking portions which are destructible upon application of a predeterminable torque thereto.

The achievement of the necessary torque is thus indicated by the destruction of the predetermined breaking portion. The destruction of the predetermined breaking portion is also readily perceptible by operatives. The necessary cross-section of the predetermined breaking portion can be accurately calculated. The tool in accordance with the invention is very simple and needs practically no maintenance. Since the part that is to be separated upon tightening is not securely connected to the fastening element, no corrosion problems arise.

In an advantageous form of the invention each predetermined breaking portion is formed by a circumferential groove. The tear-off behaviour at the predetermined breaking portion can, in this case, be influenced by the dimensions of the width and depth of the groove as well as of a possible corner radius. Dependent hereon, one can achieve pure separation breakage, or deformation breakage.

In a particularly advantageous design, the entrainment part is designed as a polygonal rod. Suitable for this purpose is, for example, a square rod or a hexagonal rod. This facilitates, on the one hand, its connection to the fastening element and, on the other hand, its connection to the lever arm for application of the torque. Since the material can be used practically "from the rod", this also means a very economical solution.

In addition to bolts and screws having polygonal sockets in their heads, the tool of the invention may be employed in connection with screw heads and nuts of polygon configuration. In order to tighten these with the tool in accordance with the invention is advantageous for the entrainment part to be in the form of a polygonal tube. In this respect, hexagonal tubes are particularly suitable, since square-headed screws and square nuts are nowadays used only seldom. The tube is then so weakened by the predetermined breaking portions in accordance with the invention that the residual cross-section is just still adequate for transmitting the necessary torque.

The entrainment part is, in principle, a disposable part, because each of its regions connected by the breaking portions is used only once. On the other hand the lever arm can be used as often as desired, since it is subject to practically no wear. Economically, it is therefore advantageous if the lever arm is connected releasably to the entrainment part. With such a releasable connection, the lever arm can always be brought into engagement with that region of the entrainment part which lies nearest to the region engaging with the fastening element. In this way it is ensured that the regions are separated successively one after the other. After the severing of the foremost region, the lever arm must be stepped along the entrainment part by a distance equal to one region.

So that the entrainment part and the lever arm do not fall apart when being handled, it is advantageous to provide a locating device between the two parts. The lever arm must, however, after the tightening and the therewith ensuing severing of the foremost region be stepped by one region. In order enable this to be done quickly, it is advantageous to provide a spring element for locating the entrainment part relative to the lever arm. The force of this spring element can be relatively slight, since it does not participate in the transmission of the torque from the lever arm to the entrainment part and serves merely to prevent any unintentional shifting of the lever arm on the entrainment part.

The invention will be described further, by way

of example, with reference to the accompanying drawing in which:

Figure 1 is a part-sectional elevation illustrating a preferred embodiment of the tool of the invention;

Figure 2 is a front view of the tool of Figure 1;

Figure 3 is a fragmetary part-sectional elevation, to an enlarged scale compared with Figures 1 and 2, illustrating a second embodiment of the tool of the invention; and

Figure 4 is a section taken on the line IV—IV of Figure 3.

The tool illustrated in Figure 1 comprises an entrainment part which is designated as a whole by the numeral 1 and a lever arm which is connectable thereto and which is designated as a whole by the numeral 2. The entrainment part 1 is in the form of a hexagonal rod and has a plurality of circumferential grooves 1*a* which subdivide the entrainment part 1 into several successive regions 1*b*. By way of example a screw 3 having a hexagonal socket in its head is shown as the fastening element with which the tool is being used. The lever arm 2 has on one end a bush 2*a*, bore 2*b* of which is hexagonal in shape to correspond with the entrainment part 1.

Transmission of torque from the lever arm 2 to the entrainment part 1 is effected by way of the bush 2*a*. The bore 2*b* of the bush 2*a* is provided with a circumferential recess 2*c* in its inner surface. In this recess 2*c* there is a spring ring 4. This spring ring 4 serves for locating the entrainment part 1 relative to the lever arm 2. Upon tightening of the fastening element 3, destruction of the predetermined breaking point between the foremost and the second-foremost region occurs when a predetermined torque is reached. When this destruction has occurred, the entrainment part is pushed by one region further into the bush 2*a*, to enable a next subsequent fastening element to be tightened, when the spring ring 4 engages into the next groove 1*a*.

Figure 2 shows the lever arm 2 with the bush 2*a* connected thereto and the entrainment part 1 which is hexagonal in cross-section. The previously-broken breaking portion of the foremost region is shaded with dots.

The tool illustrated in Figure 3 comprises an entrainment part which is designated as a whole by the numeral 6, and a lever arm which is connected thereto and which is designated as a whole by the numeral 7. The entrainment part 6 is in the form of a hexagonal tube and has a circumferential grooves 6*a*, which are at a spacing from one another, around its periphery. As a result of the grooves 6*a*, regions 6*b* are provided, which regions 6*b* are connected to one another by way of predetermined breaking points. The lever arm 7 is connected to a bush 7*a*. This bush 7*a* has a bore 7*b* which is hexagonal in configuration to correspond with the outside contour of the entrainment part 6. The bore 7*b* is provided with a circumferential recess 7*c* in its inner wall. Arranged in this recess 7*c* is a spring ring 8 which serves for locating the entrainment part 6 with the bush 7*a*. Shown in the entrainment part 6 as a fastening element to be tightened is, for example, a hexagonal nut 9. The height of the nut 9 (or of a possible screw head) must, however, be less than the length of one region of the entrainment part 6. If this is not the case, then the nut or the screwhead might project so far into the next region, present in the bush 7*a*, of the entrainment part 6, so that the predetermined breaking point lying therebetween cannot be sheared off.

Figure 4 illustrates a section through the entrainment part 6 shown in Figure 3. The depth of the groove 6*a* should, of course, be smaller than the wall thickness of the entrainment part 6. The lever arm 7 is releasably connected to the entrainment part 6.

Claims

1. A tool for applying a torque to fastening elements such as screws, bolts, and nuts, comprising an entrainment part which has entrainment surfaces for transmitting torque to a fastening element, and a lever arm for applying the torque, characterised in that the entrainment part has regions which are arranged one after the other in succession and which are connected together by way of predetermined breaking portions which are destructible upon application of a predeterminable torque thereto.

2. A tool as claimed in claim 1, characterised in that each predetermined breaking point is formed by a circumferential groove.

3. A tool as claimed in claim 1 or 2, characterised in that the entrainment part is in the form of a polygonal rod.

4. A tool as claimed in claim 1 or 2, characterised in that the entrainment part is in the form of a polygonal tube.

5. A tool as claimed in any preceding claim characterised in that the lever arm is releasably connected to the entrainment part.

6. A tool as claimed in any preceding claim characterised in that a spring element is provided for locating the entrainment part relative to the lever arm.

7. A tool for applying a torque to fastening elements substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 2 or in Figures 3 and 4 of the accompanying drawing.

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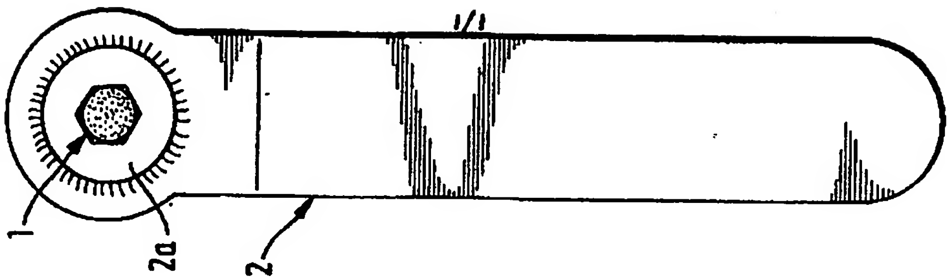

Fig. 2

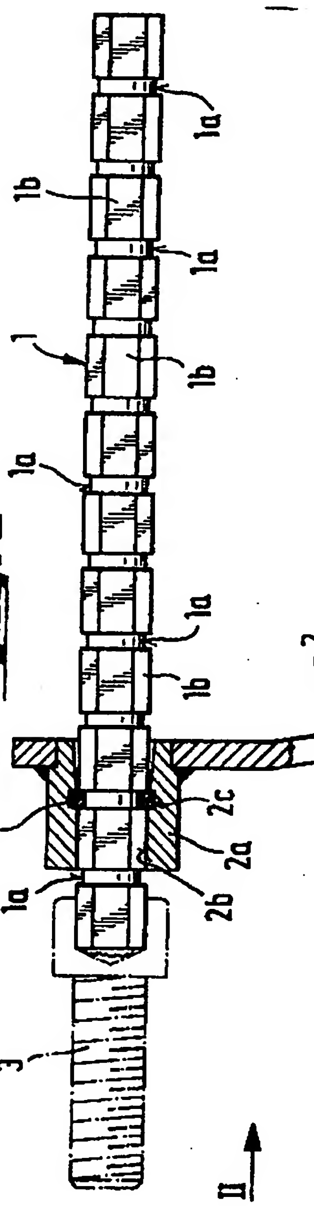

Fig. 1

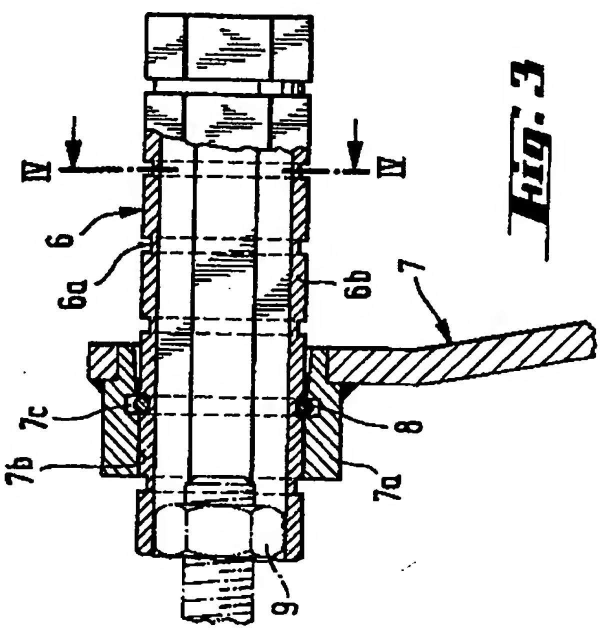

Fig. 3

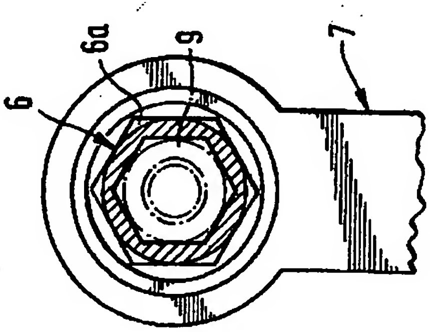

Fig. 4